
TERRA
DYNAMICS INC

1.0 EXECUTIVE SUMMARY

Exxon Mobil Corporation, (ExxonMobil) is submitting this land disposal restriction exemption reissuance (petition) to amend the January 15, 2009 Exxon Mobil Corporation Final Petition Decision. This re-issuance request is being submitted, and is associated with ExxonMobil's decision to construct an additional new Class I injection well (WDW-398) at the ExxonMobil Pasadena, Texas facility.

This petition is submitted pursuant to regulations in 40 CFR 148 and covers wastewater from the ExxonMobil Pasadena facility. The waste stream is defined as hazardous and the following RCRA waste codes have been assigned to the waste streams injected at the ExxonMobil Pasadena facility: D002, D004, D005, D006, D007, D008, D009, D023, D024, D025, D030 and F039 (for the constituents listed in Table 6-3 in this petition reissuance document). ExxonMobil applied for, and received, an exemption to the land disposal restrictions imposed by the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Resource Conservation and Recovery Act (RCRA). The exemption allows ExxonMobil to inject wastewaters which would otherwise be banned for land disposal. The petition decision (exemption to the land disposal restrictions) was granted on January 15, 2009 under 40 CFR 148 Subpart C, and expires on December 31, 2020. This petition re-issuance document satisfies all regulatory standards and procedures. It shows that the ExxonMobil injection wells meet all necessary requirements for a land ban exemption.

1.1 Facility Location and Information

The ExxonMobil Class I injection wells (WDW-397 and WDW-398) are located within the boundaries of the Agrifos Pasadena Fertilizer Plant, on property which is owned by Exxon Mobil Corporation (refer to the figure on Page 1-8). The Pasadena Fertilizer Plant (the plant) is currently owned and operated by Agrifos Fertilizer, Inc. The plant was owned by Mobil Oil Corporation from 1979 to 1998, at which time it was sold to Agrifos Fertilizer, Inc. Pursuant to a contractual agreement between the parties, ExxonMobil has assumed responsibility for certain environmental matters at the site, including the regulatory closure of certain gypstacks.

The Pasadena Fertilizer Plant is located along the Houston Ship Channel and is bounded by the channel to the north, and industrial facilities to the east, west and south. The site encompasses a total of approximately 509 acres, of which approximately 360 acres are

comprised of settling ponds containing phosphogypsum and process water from phosphoric acid production. These settling ponds are commonly referred to as "gypstacks." The remaining acreage at the site is comprised of the production areas (71 acres), wetland treatment areas (35 acres) and administrative and miscellaneous facilities (43 acres). The City of Houston operates two dredge soil storage basins located between the production plant area on the Houston Ship Channel and the Agrifos South Gypstack complex.

The Pasadena Fertilizer Plant has the capacity to produce approximately 600,000 tons per year (TPY) of granular diammonium phosphate (DAP) and monoammonium phosphate (MAP) fertilizer, and approximately 60,000 TPY of liquid ammonium thiosulfate fertilizer. The facility includes a sulfuric acid plant for the production of phosphoric acid. Phosphoric acid is used on site in the manufacture of fertilizer products. The sulfuric and phosphoric acid plants have a capacity of approximately 600,000 TPY and 280,000 TPY, respectively.

The manufacture of phosphoric acid involves the contact of phosphate rock with sulfuric acid, which produces phosphoric acid and hydrated calcium sulfate (phosphogypsum or gypsum), the major by-product. The phosphoric acid is then separated from the phosphogypsum and concentrated. In a separate process, concentrated phosphoric acid is used to manufacture ingredients for inorganic fertilizer including DAP and MAP which are produced when phosphoric acid is reacted with anhydrous ammonia.

Water is added to the waste gypsum to create a slurry that is hydraulically pumped to settling ponds. The ponds contain under-drain systems to collect the pond water as it seeps through the gypsum material built up in the pond. As the ponds fill with gypsum solids, the solids are scooped out to build up the side walls. The side walls of the ponds are continually built up allowing the gypsum to settle out, thus raising the bottom of the pond to form the "gypstack". The phosphoric acid process water ("pond water") that remains in the ponds after the gypsum solids settle out is recycled back into the phosphoric acid production process. The pond water in an operating facility typically has a pH of approximately 1.5 to 2.0.

The major effort in the "closure" of a gypstack involves the management of the pond water held as ponded surface water on top of the gypstack, and phreatic water contained within the gypstack. Once the pond water is removed from the gypstack, the gypstack may be closed similar to a landfill: this includes grading the gypstack to allow positive

stormwater run-off, use of a cap (e.g., natural clay, geosynthetic clay, geomembrane, geocomposite, etc.), an evapotransporation (ET) cap (soil and vegetative cover), and/or a combination cap and ET cap to reduce the vertical migration of stormwater through the gypstack. Clean stormwater run-off is collected and removed from the gypstack system. Pond water management at this facility will include surface treatment of the pond water for deep well injection into Class I injection wells.

The waste stream proposed for disposal in the ExxonMobil injection wells is the pond water from the gypstacks. The pond water is collected from the gypstacks through an underdrain system in the stacks; the surface pond water seeps through the gypstacks and is collected in the under-drain systems that discharge into toe ditches surrounding the gypstacks, which then discharge into collection ponds. During normal phosphoric acid production operations the pond water is either recycled back into the phosphoric acid production process or returned back to the top of the gypstack. The phosphoric acid production process is a water consumer during normal operations.

When destined for disposal, the process water is exempt from the Resource Conservation and Recovery Act (RCRA) under the provisions of the Mining Waste Exclusion of RCRA. The Mining Waste Exclusion is incorporated into the RCRA statute at 42 U.S.C. 6921(b)(3) (Solid Waste Disposal Act §3001(b)(3)), known as the 1980 "Bevill Amendment." EPA has confirmed in regulations the applicability of the Bevill Amendment to specific waste streams from the production of phosphoric acid; those wastes are not "hazardous wastes" under RCRA when discarded:

40 CFR §261.4(b)(7)(ii)(D) and (P) .

> (ii) For the purposes of §261.4(b)(7), solid waste from the processing of ores and minerals includes only the following wastes as generated:
>
> (D) Phosphogypsum from phosphoric acid production;
>
> (P) Process wastewater from phosphoric acid production.

As indicated earlier, the Agrifos facility includes a plant for the manufacture of sulfuric acid. The plant produces 98% sulfuric acid from sulphur dioxide (SO_2). This acid is too highly concentrated for direct use in the manufacture of phosphoric acid. As such, in an arrangement that has been in place since the 1970's, this 98% sulfuric acid product is sold to a neighboring chemical facility that uses the acid in its manufacturing process and then returns the acid to Agrifos in a more dilute form (appropriate for phosphoric acid production), without prior processing. The return acid stream contains a low level of 2,4-

dinitrotoluene (2,4-DNT), which is one of the products that the neighboring chemical plant manufactures. The level of 2,4-DNT in the acid returned to Agrifos may be at concentrations above the toxicity characteristic of 0.13 milligrams per liter (mg/L). In a letter to Agrifos dated April 26, 2006, the Texas Commission on Environmental Quality (TCEQ) confirmed that the Bevill exemption applicable to wastewater from the phosphoric acid manufacturing process is not affected by the presence of 2,4-DNT in the sulfuric acid received from the neighboring chemical company supplier, when the sulfuric acid received by Agrifos is used by Agrifos as a raw material in its manufacturing process.

Based on the nature of the processes involved at this facility, the process wastewater from the production of phosphoric acid is exempt from the requirements of RCRA under the Bevill Amendment. Therefore, the wastewater stream intended for injection down the Class 1 wells is exempt from regulation as a hazardous waste.

Disposal of process wastewater from the phosphogypsum stacks at this facility in the currently permitted TCEQ Class I non-hazardous waste injection well is consistent with the Bevill exemption. The TCEQ agrees. However, ExxonMobil is aware that EPA has recently raised questions about the applicability of Bevill within the phosphoric acid manufacturing industry in general (including at this facility), and ExxonMobil also recognizes the urgent need for a resolution of this issue to allow disposal of process wastewater in the event that manufacturing operations at this facility should terminate. Consequently, due to the questions recently raised by EPA (which we are currently seeking to respond to and resolve) and the urgent need to be able to dispose of water if the manufacturing process ceases, ExxonMobil is submitting this petition to allow injection of this process wastewater into two Class I injection wells (WDW-397 [active] and WDW-398 [proposed]) as though the wastewater stream is "non-exempt." This petition demonstrates that the ExxonMobil injection wells meet the requirements for a land ban exemption.

Note: Submission of this application to EPA should not be viewed as an agreement or conclusion by ExxonMobil that the process wastewaters are outside the scope of the Bevill Amendment. References in this application to waste constituents in the wastewater possessing certain RCRA waste codes (e.g., D002, D030) is not intended as a formal designation of the waste stream as a hazardous waste, but is intended only to illustrate the waste codes that might be applicable should the waste stream be designated

a hazardous waste. The application is being sent to EPA at this time to facilitate the Agency's review of the waste water disposal issue which may be time sensitive.

1.2 Document Organization and Section Summary

This petition covers two Class I injection wells: (1) WDW-397 and (2) WDW-398. In accordance with 40 CFR §148.20, this petition demonstrates compliance with the prescribed standard of "no migration" by application of a combination of analytical and numerical computer models simulating deep well injection operations at the ExxonMobil facility. The modeling contained in this petition demonstrates there will be "no-migration" of injected fluids from the designated injection zone within a period of more than 10,000 years. See Section 7.0 (Modeling).

The geologic study area for each well was determined to be the area lying within about 15 miles from either wellbore based on the predicted position of the waste plume after 10,000 years. The Area of Review (AOR) was defined as the area within a 2.0-mile radius around the subject injection wells and the area encompassed by the 10,000-year modeled waste plume. A total of 248 non-freshwater artificial penetrations were identified within the applicable area of review. A total of 13 fresh water artificial penetrations were identified within 2.0 miles of the two injection wells. None of these artificial penetrations offer any significant potential for upward migration of fluids due to injection operations at ExxonMobil. See Section 8.0 (Area of Review).

This petition includes a geologic study of the area surrounding the injection wells in which the regional and local geologic environment is reviewed and described. This study addresses both surface and subsurface environments and includes hydrology, natural resources (ground water, hydrocarbons, etc.), stratigraphy, hydrostratigraphy, structural geology, seismicity and hydrogeology. Based on the data submitted with this petition, geologic conditions are such that it can be conclusively demonstrated that deep well injection operations can be conducted in an environmentally sound manner at the ExxonMobil facility. The Frio Formation comprises the Injection Interval for WDW-397 and WDW-398. Three (3) distinct sand intervals: the Frio D Sand, the Frio E&F Sand and the Frio A/B Sand, are (or will be) utilized for waste injection. Moreover, the Frio Formation, which comprises the Injection Interval of WDW-397 and WDW-398, is overlain by a thick impermeable interval adequate to contain fluid movement in the Injection Zone. These low permeability units contribute to vertical containment of

hazardous constituents for the mandatory 10,000-year period. See Section 4.0 (Geology and Hydrogeology).

Section 5.0 (Injection Well Construction) of this petition describes well installation, operating history, monitoring procedures and the steps taken to ensure the mechanical integrity of ExxonMobil's injection wells. ExxonMobil is committed to operate and monitor its injection wells in accordance with applicable state and federal regulations.

WDW-397 and WDW-398 are completed in such a manner as to adequately protect and isolate the lowermost Underground Source of Drinking Water (USDW) and any other USDW in the area from potential contamination due to injection operations. In addition, ExxonMobil has committed to operate and monitor the injection wells in such a manner as to ensure mechanical integrity over the operating life of each well. Given site conditions, operating the wells according to existing regulations is intended to ensure that the lowermost USDW or any other USDW in the area will not be affected by injection of waste into the ExxonMobil disposal wells. The results of the most recent mechanical integrity tests conducted on WDW-397 and WDW-398 will be submitted under separate cover.

A discussion of the waste streams ExxonMobil is requesting an exemption from land disposal prohibition for is included in Section 6.0 (Injection Fluids) of this petition. Also included in Section 6.0 is a discussion of materials of construction compatibility and formation brine and formation matrix compatibility with the ExxonMobil waste stream.

The modeling performed to demonstrate compliance with the prescribed standard of "no-migration" in accordance with the requirements of 40 CFR §148.20 is included in the Section 7.0 (Modeling). A numerical computer model was chosen as the best available tool to simulate lateral waste plume movement and reservoir pressure buildup, and an analytical model was chosen as the best available tool to simulate vertical waste plume movement due to injection well operations at the ExxonMobil facility. This petition demonstration sets out certain operational criteria which ExxonMobil will follow so that this demonstration remains valid. The modeling demonstration limits future injection into the Frio D Sand to a cumulative rate of (360 gpm X 1,440 minutes/day X number of days in that month). The demonstration is made such that either well may receive up to a rate of (360 gpm X 1,440 minutes/day X number of days in that month), as long as the cumulative rate is not exceeded. The modeling demonstration was made for a cumulative

injection rate of (1,200 gpm X 1,440 minutes/day X number of days in that month) into either the Frio E&F Sand and/or the Frio A/B Sand. The demonstration is made such that either well may receive up to a rate of (1,200 gpm X 1,440 minutes/day X number of days in that month), as long as the cumulative rate is not exceeded. Future injection rates were modeled at the requested injection rates for a period beginning January 1, 2009 and ending December 31, 2020.

Section 3.0 (Implementation and Compliance) addresses how ExxonMobil will comply with the requested specific gravity/density and injection rate limitations requested in this petition demonstration. In addition, the Implementation and Compliance section includes information concerning the need to run an annual flow profile survey to confirm flow distribution into the Frio D Sand, the Frio E&F Sand and the Frio A/B Sand and to confirm that the injection rate into the Frio D Sand does not exceed 360 gpm for any monthly average total injection rate into WDW-397 which exceeds (360 gpm)(1,440 minutes/day)(number of days in that month). WDW-398 is not completed to inject into the Frio D Sand. Section 9.0 (Quality Assurance/Quality Control) discusses the steps and procedures followed to ensure the accuracy of this demonstration and the data offered as reference and supporting documentation.

This petition document demonstrates that, to a reasonable degree of certainty, there will be no-migration of hazardous constituents from the Injection Zone for as long as the waste remains hazardous. This petition demonstrates that the hydrogeological and geochemical conditions at the ExxonMobil injection well site and the physiochemical nature of the waste stream(s) are such that reliable predictions can be made that fluid movement conditions are such that the injected fluids will not migrate within 10,000 years vertically upward out of the injection zone; or laterally within the injection zone to a point of discharge or interface with an Underground Source of Drinking Water (USDW).

1.3 Application of Petition Demonstration to Identified Hazardous Wastes

A description of the potentially hazardous wastes ExxonMobil proposes to dispose of by deep well injection is presented in Section 6.0 (Injection Fluids). Table 6-3 lists the possible waste codes and chemical names for all of the hazardous waste constituents petitioned for in this document. The TCEQ UIC permits for WDW-397 and WDW-398 are included in Appendix A. A copy of the January 15, 2009 Exxon Mobil Corporation Final Petition Decision is also included in Appendix A. The requested petition conditions

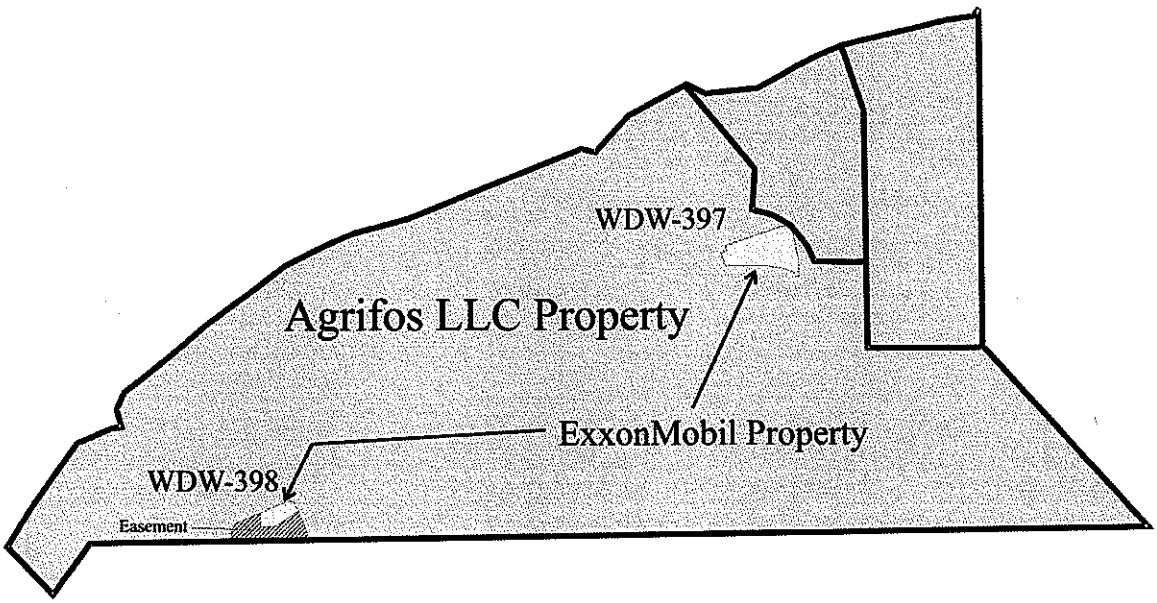
for this reissuance of the exemption to the land disposal restrictions for WDW-397 and WDW-398 is included in Section 2.0.

1.4 Information for Notification – Adjacent Property Ownership Data

The ExxonMobil properties on which the WDW-397 and WDW-398 injection wells are located are within the boundaries of (and surrounded by) the Agrifos Fertilizers LLC property. ExxonMobil has a limited access/easement to use a portion of Agrifos property located south of the WDW-398 well location to lay pipelines and to gain access to the acreage on which the WDW-398 injection well and associated surface facilities are located. The ExxonMobil property on which the WDW-398 injection well is located does not contact the Agrifos LLC property line. Agrifos is the only property owner adjacent to the ExxonMobil injection well properties.

Adjacent Property Owners:

AGRIFOS LLC
PO BOX 3447
PASADENA TX 77501




TERRA
DYNAMICS INC

2.0 GENERAL ADMINISTRATIVE INFORMATION

2.1 Applicant Identification

This application for a land disposal restriction exemption for the underground injection of hazardous waste is submitted by:

Name:	Exxon Mobil Corporation
Address:	1545 Rt 22 East, Room CC302
City:	Annandale
State:	New Jersey
Zip Code:	08801
Phone:	(908) 730-3510

Facility Location

The Exxon Mobil Corporation injection well facilities are located at:

Address:	2001 Jackson Road
City:	Pasadena
State:	Texas
Zip Code:	77501-3447

2.2 Authorization of Applicant

The listed individuals of the following firms are authorized to act for, or respond to, questions concerning this application during the processing of this application.

Primary Authorization

The following employees of ExxonMobil are authorized to act on behalf of ExxonMobil:

Name:	F. E. Buddy Hand, Jr.
Company:	ExxonMobil Environmental Services Company
Address:	12450 Greenspoint Drive
City:	Houston
State:	Texas
Zip Code:	77060
Phone:	(281) 654-8457 FAX (281) 654-8487

Other Authorization

The following employees of Terra Dynamics Incorporated, Austin, Texas are authorized to respond to questions concerning this application on behalf of the applicant should reasonable attempts to contact the applicant be unsuccessful or if otherwise referred to by the applicant:

Name:	Terry D. Moody, PG
Title:	Project Manager and Senior Geologist
Phone:	(512) 795-8183
Company:	Terra Dynamics Incorporated
Address:	4606 West Howard Lane, Suite 9-980
City:	Austin
State:	Texas
Zip Code:	78728

Name:	Philip R. Grant, PG
Title:	Project Manager and Senior Geologist
Phone:	(512) 795-8183
Company:	Terra Dynamics Incorporated
Address:	4606 West Howard Lane, Suite 9-980
City:	Austin
State:	Texas
Zip Code:	78728

2.3 Public Notice Responsibility

The following person is responsible for the publication of any notices requested of the applicant during the processing of this demonstration:

Name:	Terry D. Moody, PG
Title:	Project Manager and Senior Geologist
Phone:	(512) 795-8183
Company:	Terra Dynamics Incorporated
Address:	4606 West Howard Lane, Suite 9-980
City:	Austin
State:	Texas
Zip Code:	78728

2.4 Site Description

The Pasadena Fertilizer Plant is currently owned and operated by Agrifos L.L.C. (Agrifos) and has the capacity to produce approximately 600,000 tons per year (TPY) of granular diammonium phosphate (DAP) and monoammonium phosphate (MAP)

fertilizer, and approximately 60,000 TPY of liquid ammonium thiosulfate fertilizer. The Pasadena Fertilizer Plant operates both a sulfuric acid plant and phosphoric acid plant in the manufacture of these fertilizer products. The sulfuric and phosphoric acid plants have a capacity of approximately 600,000 TPY and 280,000 TPY, respectively.

The Pasadena Fertilizer Plant is located along the Houston Ship Channel and is bounded by the channel to the north, and industrial facilities to the east, west and south. The site encompasses a total of approximately 509 acres, of which approximately 360 acres are comprised of settling ponds containing phosphogypsum and process wastewater from phosphoric acid production (see Figure 2-1). These settling ponds are commonly referred to as "gypstacks". The remaining acreage is comprised of the production areas (71 acres), wetland treatment areas (35 acres) and administrative and miscellaneous facilities (43 acres). The City of Houston operates two dredge soil storage basins located between the production plant area on the Houston Ship Channel and the Agrifos South Gypstack complex.

The Pasadena Fertilizer Plant was purchased by Mobil Mining and Minerals Company in 1979 and subsequently sold to Agrifos in 1999. As part of a previous sales agreement, ExxonMobil retained some closure obligations at the site. ExxonMobil desires to construct a Class I injection well(s) at the Pasadena Fertilizer Plant which will be utilized to dispose of pond water generated during the closure of "gypstacks" located at the facility. ExxonMobil owns two property easements on the plant site that will be utilized for the WDW-397 and WDW-398 injection wells and surface facilities. ExxonMobil owns, or will own, the injection well(s), surface facilities and the property on which the injection well(s) and surface facilities are located.

2.5 Current Injection Well Permit Data

ExxonMobil currently holds two (2) injection well permits to inject gypsum stack pond water. WDW-397 and WDW-398 are permitted to inject into the Frio Formation in the approximate subsurface interval between 5,900 and 7,250 feet below ground level (GL). The permitted Injection Zone extends from approximately 5,325 to 7,250 feet GL. Copies of the current permits for WDW-397 and WDW-398 are included in Appendix A.

2.5.1 WDW-397

WDW-397 was originally permitted January 26, 2004. The permit was amended and reissued on February 22, 2010. The permit expires on January 26, 2014. The permitted Injection Zone for WDW-397 is within the Frio Formation from approximately 5,325 to 7,250 feet GL. WDW-397 is authorized to inject fluids into the Frio Formation Injection Interval from approximately 5,900 to 7,250 feet GL.

WDW-397 is permitted to inject industrial hazardous and non-hazardous waste fluids as follows:

1. Gypsum stack pond water (Gyp-Stacks #1, #2, #3, #4 and #5).
2. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes, Injection Zone and the well.
3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams, Injection Zone and well materials.

The pH of the injected waste streams shall be greater than 1.0 and less than 8.0. Except when authorized by the Executive Director, the specific gravity of injected fluids shall be greater than or equal to 1.00 and less than or equal to 1.05 as measured at 68 °F. More detail on these waste streams is available in Injection Fluids Section of this petition.

WDW-397 is permitted to inject waste fluids subject to the following operating (injection rates and injection pressure) parameters:

- The operating surface injection pressure shall not exceed 1,500 psig.
- The maximum cumulative injection rate for WDW-397 and WDW-398 shall not exceed 1,200 gallons per minute.

- The cumulative volume of wastewater injected into WDW-397 and WDW-398 shall not exceed 52,560,000 gallons per month, or 630,720,000 gallons per year.

2.5.2 WDW-398

WDW-398 was originally permitted January 26, 2004. The original permit was amended and reissued on February 22, 2010. The permit expires on January 26, 2014. The permitted Injection Zone for WDW-398 is within the Frio Formation from approximately 5,325 to 7,250 feet GL. WDW-398 is authorized to inject fluids into the Frio Formation Injection Interval from approximately 5,900 to 7,250 feet GL.

WDW-398 is permitted to inject industrial hazardous and non-hazardous waste fluids as follows:

1. Gypsum stack pond water (Gyp-Stacks #1, #2, #3, #4 and #5).
2. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes, Injection Zone and the well.
3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams, Injection Zone and well materials.

The pH of the injected waste streams shall be greater than 1.0 and less than 8.0. Except when authorized by the Executive Director, the specific gravity of injected fluids shall be greater than or equal to 1.00 and less than or equal to 1.05 as measured at 68 °F. More detail on these waste streams is available in Injection Fluids Section of this petition.

WDW-398 is permitted to inject waste fluids subject to the following operating (injection rates and injection pressure) parameters:

- The operating surface injection pressure shall not exceed 1,500 psig.
- The maximum cumulative injection rate for WDW-397 and WDW-398 shall not exceed 1,200 gallons per minute.
- The cumulative volume of wastewater injected into WDW-397 and WDW-398 shall not exceed 52,560,000 gallons per month, or 630,720,000 gallons per year.

2.6 Proposed Injection Well Petition Conditions

This petition reissuance seeks to add the operation a second Class I injection well (WDW-398) at the ExxonMobil facility location. In addition, this petition reissuance seeks to amend the individual and cumulative volumes authorized for injection at the facility. The currently authorized petition conditions (for operation of a single well – WDW-397) are included in the following paragraphs followed by the proposed petition reissuance conditions which incorporate the addition of a second well (WDW-398) and include revisions to the authorized injection rates and volumes.

Currently Authorized Petition Conditions

The following are conditions of this exemption to the land disposal restrictions:

Petition Approval Conditions

This petition of exemption approval to allow the injection of restricted hazardous wastes is subject to the following conditions, which are necessary to assure that the standard in 40 CFR §148.20(a) is met. Noncompliance with any of these conditions is grounds for termination of the exemption in accordance with 40 CFR §148.24(a)(1). This exemption is applicable to the ExxonMobil injection well, WDW-397, located at the Agrifos Fertilizer Plant in Pasadena, Texas.

1. Injection of restricted waste shall be limited to the following injection zone:

Well	Depth of Injection Zone
WDW-397	5347'-7272' KB

(WDW-397 depths referenced to 3/08/06 High Resolution Array Induction Density Neutron Longspace Sonic Log using KB depths in feet)

The injection interval shall be defined by the following correlative log depths:

Well	Injection Interval	Depth of Injection Interval
WDW-397	Frio D, E&F, and A/B Sands	5922'-7272' KB

(WDW-397 depths referenced to 3/08/06 High Resolution Array Induction Density Neutron Longspace Sonic Log using KB depths in feet)

Injection of restricted waste shall also be limited to completion intervals which are within the defined injection interval and below a depth of 6200' KB

2. For WDW-397, the cumulative monthly volume injected into the Frio D Sand during any given month shall not exceed that calculated by multiplying 140 gpm x 1440 minutes/day x the number of days in that month. For WDW-397, the cumulative monthly volume injected into the Frio E&F Sand shall not exceed that calculated by multiplying 700 gpm x 1440 minutes/day x the number of days in that month. For WDW-397, the cumulative monthly volume injected into the Frio A/B Sand shall not

exceed that calculated by multiplying 700 gpm x 1440 minutes/day x the number of days in that month. Additionally the total cumulative monthly wellhead volume for WDW-397 shall not exceed that calculated by multiplying 700 gpm x 1440 minutes/day x the number of days in that month.

3. The facility shall cease injection into WDW-397 by December 31, 2020.

4. The characteristics of the injected waste stream shall for WDW-397 at all times conform to those discussed in Section 6 of the 2008 petition document for WDW-397. The specific gravity of the waste stream for WDW-397 shall remain within a range from 1.00 to 1.05 at 68°F and 1 atmosphere with a reference temperature of 68°F.

5. The approval for injection is limited to the following hazardous wastes: D002, D004, D005, D006, D007, D008, D009, D023, D024, D025, D030 and F039 (for the constituents listed in Table 6-3 in the 2008 petition document)

6. The facility must petition for approval to inject additional hazardous wastes which are not included in Condition No.5, above. The facility must also petition for approval to increase the concentration of any waste which would necessitate the recalculation of the limiting concentration reduction factor and the extent of the waste plume. Petition reissuances and modifications should be made pursuant to 40 CFR §148.20 (e) or (f).

7. For WDW-397, a flow profile, acceptable to the Agency, shall be run annually to confirm flow distribution in the Frio D, E&F, and A/B Sands.

   Upon recompletion of this well into any currently uncompleted portion of the injection interval, a flow profile survey, acceptable to the Agency, shall be run to confirm flow distribution in the Frio D, E&F, and A/B Sands.

8. ExxonMobil shall annually submit to EPA the results of a bottom hole pressure survey for WDW-397. This survey shall be performed after shutting in the well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with 40 CFR §146.68(e)(I). The annual report should include a comparison of reservoir parameters determined from the falloff test with parameters used in the approved no migration petition.

9. Upon the expiration, cancellation, reissuance, or modification of the Texas Commission on Environmental Quality's Underground Injection Control permit for Well No. WDW-397, this exemption is subject to review. A new demonstration may be required if information shows that the basis for granting the exemption is no longer valid under 40 CFR §148.23 and §148.24.

Petition Approval Conditions (Proposed)

1. Injection of restricted waste shall be limited to the following Injection Zone:

Well	Depth of Injection Zone
WDW-397	5347'-7272' KB
WDW-398	5370'-7295' KB

(WDW-397 depths referenced to 3/08/06 High Resolution Array Induction Density Neutron Longspace Sonic Log using KB depths in feet; WDW-398 depths referenced to 7/18/09 Array Induction Log using KB depths in feet). Note that the base of the Injection Zone is below the total depth of each well.

The Injection Interval shall be defined by the following correlative log depths:

Well	Injection Interval	Depth of Injection Interval
WDW-397	Frio D, E&F, and A/B Sands	5922'-7272' KB
WDW-398	Frio D, E&F, and A/B Sands	5965'-7295' KB

(WDW-397 depths referenced to 3/08/06 High Resolution Array Induction Density Neutron Longspace Sonic Log using KB depths in feet; WDW-398 depths referenced to 7/18/09 Array Induction Log using KB depths in feet). Note that the base of the Injection Interval is below the total depth of each well.

Injection of restricted waste shall also be limited to completion intervals which are within the defined injection interval and below a depth of 6200' KB in WDW-397 and 6,276 feet KB in WDW-398.

2. The volume injected into WDW-397 during any given month shall not exceed (360 gpm)(1,440 minutes/day)(number of days in that month) into the Frio D Sand. WDW-398 is not, and will not be, completed to inject into the Frio D Sand.

The cumulative volume injected into WDW-397 and WDW-398 during any given month shall not exceed (1,200 gpm)(1,440 minutes/day)(number of days in that month) into the Frio E&F Sand. The volume injected into WDW-397 during any given month shall not exceed (1,200 gpm)(1,440 minutes/day)(number of days in that month) into the Frio E&F Sand. The volume injected into WDW-398 during any given month shall not exceed (1,200 gpm)(1,440 minutes/day)(number of days in that month) into the Frio E&F Sand.

The cumulative volume injected into WDW-397 and WDW-398 during any given month shall not exceed (1,200 gpm)(1,440 minutes/day)(number of days in that month) into the Frio A/B Sand. The volume injected into WDW-397 during any given month shall not exceed (1,200 gpm)(1,440 minutes/day)(number of days in that month) into the Frio A/B Sand. The volume injected into WDW-398 during any given month shall not exceed (1,200 gpm)(1,440 minutes/day)(number of days in that month) into the Frio A/B Sand.

3. The facility shall cease injection by **December 31, 2020.**

4. The characteristics of the injected waste stream shall at all times conform to those of Table 6-3 in the petition entitled "Hazardous Constituents in ExxonMobil Waste stream," and section 6.0. The specific gravity of the waste stream shall remain within a range of from 1.00 to 1.05 as measured at 68°F and 1 atmosphere. The reference temperature for the specific gravity analyzer will be 60°F.

5. The proposed approval for injection is limited to the following hazardous wastes: D002, D004, D005, D006, D007, D008, D009, D023, D024, D025, D030 and F039 (for the constituents listed in Table 6-3 in the 2008 petition document).

6. The facility must petition for approval to inject additional hazardous wastes which are not included in Condition No. 5, above. The facility must also petition for approval to increase the concentration of any waste which would necessitate the recalculation of the limiting concentration reduction factor and the extent of the waste plume. Petition modifications and re-issuance should be made pursuant to 40 CFR §148.20 (e) or (f).

7. A flow profile survey, acceptable to the Agency, shall be run annually in both WDW-397 and WDW-398 to confirm flow distribution into the Frio D Sand, the Frio E&F Sand and the Frio A/B Sand. The flow profile survey in WDW-397 will confirm that the injection rate into the Frio D Sand does not exceed 360 gpm for any monthly average total injection rate into WDW-397 which exceeds the product of (360 gpm)(1,440 minutes/day)(number of days in that month).

   In addition, for either WDW-397 or WDW-398, upon re-completion into any newly perforated portion of the Injection Interval, the following must be done:

   A flow profile survey, acceptable to the Agency shall be run. If the flow rate into the existing perforations becomes less than that currently modeled, the transmissivity and porosity employed in the modeling demonstration must be re-evaluated. This must be done prior to the re-establishment of injection of the wastes covered by this petition approval into the affected well, and re-demonstrated on an annual basis.

8. ExxonMobil shall annually submit to EPA the results of a bottom-hole pressure survey each for WDW-397 and WDW-398. These surveys shall have been performed after shutting in each well for a period of time sufficient to allow the pressure in the Injection Interval to reach equilibrium, in accordance with 40 CFR §146.68(a)(1). This annual report should include a comparison of reservoir parameters determined from the fall-off tests with parameters used in the approved no migration petition.

9. Upon the expiration, cancellation, re-issuance, or modification, of the Texas Commission on Environmental Quality's Underground Injection Control permit for Well Nos. WDW-397 and/or WDW-398, this exemption is subject to review. A new demonstration may be required if information shows that the basis of granting the exemption is no longer valid.

2.7 Financial Assurance

Pursuant to requirements for financial responsibility demonstration stipulated in 30 TAC §37 and 30 TAC §305.154, ExxonMobil has provided and demonstrated financial assurance to the satisfaction of the TCEQ.

2.8 Certification for Petition Information

Certification of information presented in this petition document is presented in the statements on the following page.

References

USGS, Topographic Map 7.5 min Quadrangle- Pasadena Sheet

Notes

The terms ground level (GL) and below ground level (BGL) are used in various places throughout the petition document and are equivalent with respect to measurement of subsurface depths.

CERTIFICATION STATEMENT

I, Forrest E. Hand, Jr, Project Manager
(Name) (Title)

certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

F E Hand Jr
(Signature)

4/11/11
(Date)

NOTARY STATEMENT

SUBSCRIBED AND SWORN to and before me by the said Forrest Hand on this 11 day of April, 2011.

My commission expires on the 4th day of April.

Carolyn A. Jones
Notary Public in and for
Harris County, Texas

CAROLYN A. JONES NOTARY PUBLIC STATE OF TEXAS EXPIRES 04-12-2012

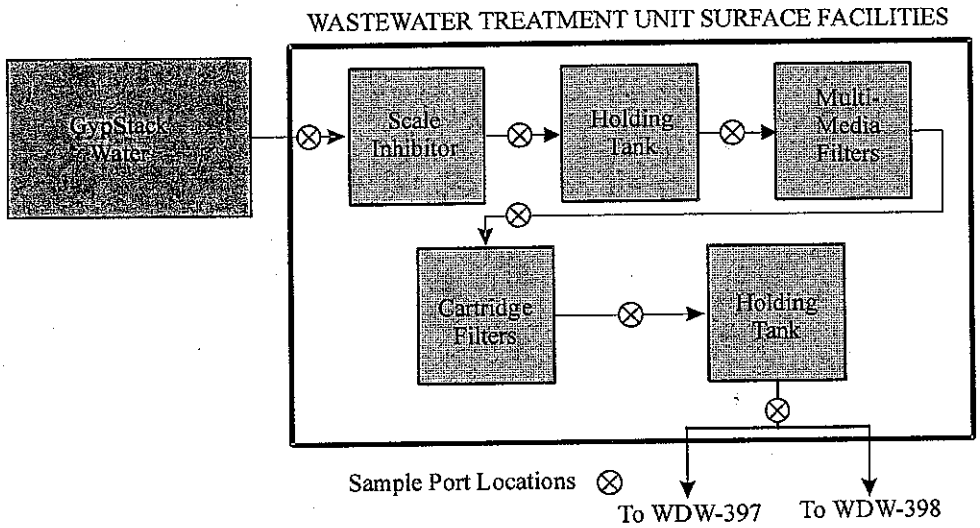

TERRA
DYNAMICS INC

3.0 IMPLEMENTATION AND COMPLIANCE

This section addresses how ExxonMobil will comply with requested specific gravity/density and injection rate limitations requested in this petition demonstration.

3.1 Waste Stream Flow Diagram

The following diagram is a waste stream flow schematic which illustrates waste stream flow to the WDW-397 and WDW-398 injection wells.



ExxonMobil utilizes pre-injection facilities for storage and removal of suspended solids in the waste fluids prior to injection. Unit operations for wastewater pre-treatment include the addition of a scale inhibitor and dual-media and cartridge filtration. As indicated on the schematic diagram, wastewater sample ports are located throughout the treatment unit surface facilities. The sample port located after the final holding tank will be utilized to collect wastewater samples prior to injection into the ExxonMobil injection wells.

The design of the pre-injection filtration facilities was developed based on consideration of corrosion of materials of construction, waste stream characteristics, formation characteristics, flow volume and economics. The waste effluent consists mostly of water and contains moderate levels of dissolved solids and low levels of suspended solids and organics [see Section 6.0 (Injection Fluids)]. Based on these criteria, pre-treatment of the composite waste stream consists primarily of filtration to reduce the solids content of the injected wastewater.

3.2 Instrumentation and Measurement Methodology

An instrumentation and control room is located near the surface facilities. Instrumentation for the surface facility and the injection well are connected to the instrumentation and control room allowing for 24 hour-a-day operations monitoring. Important well operating parameters are transmitted to the control room for continuous monitoring. These include wellhead pressure, wastewater flow rate, volume, temperature of injected fluids, annulus pressure, pH and annulus fluid tank level. This data is displayed in the control room for easy operator monitoring and continuous recording devices are in place to record the operating parameters. A computer database log of these readings is kept, and ExxonMobil reports the average flow, injection pressure, annulus pressure, annulus differential pressure, minimum pH and any other required operating parameters in a quarterly report to the TCEQ.

Annulus pressure and injection pressure gauges are installed at the wellhead to allow visual monitoring of operating conditions and a flow totalizer is installed on the flow line to the well. A sight gauge is installed on the annulus tank to allow visual inspection of annulus tank levels. Instruments and gauges, which are external to the instrumentation room, are weatherproof. Instruments and monitoring devices (pressure gauges, pressure transmitters, flow rate meters, flow rate transmitters, pH, temperature, etc) are calibrated quarterly, at a minimum. Calibration data are recorded and maintained at the facility location.

Physical samples of the injected wastewater are collected from a wastewater sample point attached to the wastewater effluent line between the final holding tank and the injection well(s). These samples are subjected to periodic chemical analysis. The wastewater sample port location is depicted in the diagram on Page 3-1. The sample port is attached to the effluent line. The high flow rate through the line (700 to 1,200 gpm) provides for adequate mixing and a homogenous liquid at the sample point.

Wastewater samples will be collected for specific gravity analysis once per day. ExxonMobil will utilize a hydrometer jar with an inside diameter of approximately 1-inch ***greater*** than the outside diameter of the hydrometer. This will minimize any undue effect surface tension will have on the readings of the hydrometer. (Note: a hydrometer jar of 50 mm (inside diameter) by 375 mm (inside height) is a typical size for the majority of hydrometers). The hydrometer will be graduated in 0.002 increments of

specific gravity. Figure 3-1 is a schematic drawing of a specific gravity analyzer, similar to the analyzer to be utilized by ExxonMobil. The hydrometer will be slowly immersed in the hydrometer jar to a point slightly beyond that at which it floats naturally (not more than 2 scale divisions), then allowed to float freely. Care will be taken to ensure that the hydrometer is not in contact with the sides of the hydrometer jar when reading. The specific gravity hydrometer will be calibrated to the standard temperature of calibration in the United States of 60°F / 60°F. The specific gravity will be read to three (3) decimal places.

To ensure uniform and reproducible readings, the surface of the hydrometer and the stem will be kept clean so that the liquid will rise uniformly and merge into an almost imperceptible film on the stem. Before a specific gravity measurement is made, the hydrometer will be thoroughly washed, rinsed and dried. The hydrometer jar will also be thoroughly washed and rinsed before the wastewater is added. To ensure uniformity of density and temperature, the liquid will be completely stirred shortly before the observation is made. Readings will not be made until both the liquid and hydrometer are free of air bubbles and are at rest. The temperature of the liquid will be determined by a precision thermometer and recorded along with the hydrometer specific gravity reading. The maintain uniformity of reporting over time, the recorded specific gravity measurements will be corrected to a temperature of 68°F. The specific gravity temperature correction will be made by comparing the density of pure water at 68°F with the denisity of pure water at the temperature recorded for the test sample. The test sample specific gravity will then be multiplied by the ratio value to correct the specific gravity to 68°F. When reporting the specific gravity results, specific gravity values will be rounded to two (2) decimal places. An example correction calculation if offered below to clarify the proposed methodology.

Assumption: Specific gravity value of the test sample is **1.030 at 75°F**.
Density of pure water at 75°F (23.9°C) is 0.997321 gm/cc (from Perrys, Table 2-88)
Density of pure water at 68°F (20°C) is 0.998204 gm/cc (from Perrys, Table 2-88)
The ratio of the density of pure water at 68°F to the density of pure water at 75°F is **1.0009** (0.998204 gm/cc / 0.997321 gm/cc).
Therefore: the specific gravity of the test sample when corrected from the measured temperature of 75°F to the reference temperature of 68°F is **1.031** (1.030 X 1.0009).
The value reported would be **1.03** after rounding the value to two (2) decimal points.

The correction factor provided in the preceding paragraphs are comparable to the correction factor provided in ASTM D 1429-95 (Standard Test Methods for Specific Gravity of Water and Brine). A copy of ASTM D 1429-95 is provided in Appendix D.

Alarms are provided in the plant control room to alert the operator to high injection pressure, high/low pH, high flow, high/low annulus pressure, high/low level in the annulus tank and high/low pressure differential. The well is shut-in in the event that any operating parameters exceed the limits set forth in the injection well permit. ExxonMobil notifies the Austin, Texas office of the TCEQ within 24 hours of any significant change in monitoring parameters or of any other observations which could reasonably be attributed to a leak or other failure of the injection well or Injection Zone integrity.

ExxonMobil keeps complete and accurate records of all monitored parameters required by the permit or required as a condition of the approved petition for the two injection wells. ExxonMobil also keeps complete and accurate records of all periodic well tests, all shut-in periods and those times when emergency measures were used for handling injection fluid, and any additional information on conditions that might reasonably affect the operation of the injection well. ExxonMobil shall also retain for a period of five years following abandonment any other records required by the permit or petition.

3.3 Annual Flowmeter Profile Survey

That portion of the Injection Interval utilized for disposal by WDW-397 and WDW-398 is composed of three (3) distinct sand intervals: the Frio D Sand, the Frio E&F Sand and the Frio A/B Sand. The modeling demonstration was made for a cumulative injection rate of (1,200 gpm X 1,440 minutes/day X number of days in that month) for a period beginning January 1, 2009 and ending December 31, 2020. The modeling demonstration limits injection into the Frio D Sand to a cumulative injection rate of (360 gpm X 1,440 minutes/day X number of days in that month). A flow profile survey, acceptable to the Agency, shall be run annually in WDW-397 and WDW-398 to confirm flow distribution into the Frio D Sand, the Frio E&F Sand and the Frio A/B Sand and to confirm that the injection rate into the Frio D Sand does not exceed 360 gpm (cumulative or, for either individual injection well) for any monthly average total injection rate into WDW-397 and/or WDW-398 which exceeds (360 gpm)(1,440 minutes/day)(number of days in that month).

Jogler® INC.

Quote Request: Specific Gravity Analyzer Tube-N-Tube 316 SS

Model: SGA-6S-FT

Key	Description	Wetted Component
Ⓐ	316 SS Vent Ball Valve, 0.25" FNPT	Y
Ⓑ	316 SS Mounting Brackets, Top & Bottom	Y
Ⓒ	316 SS Connection Flanges, Top & Bottom	Y
Ⓓ	316 SS Housing Flanges with Viton O-ring	N
Ⓔ	PTFE Teflon Superseal Inserts (Patented)	Y
Ⓕ	3.00" Inner Borosilicate Sight Tubing	Y
Ⓖ	Hydrometer (Specify Range)	Y
Ⓗ	6.00" Outer Acrylic Sight Tube	N
Ⓘ	1.00" Borosilicate Hydrometer Sleeve	Y
Ⓙ	316 SS Overflow Ball Valve, 0.25" FNTP	Y
Ⓚ	316 SS Inlet Flow Needle Valve, 0.25" FNTP	Y
Ⓛ	316 SS Main Drain Ball Valve, 0.25" FNTP	Y
Ⓜ	(4) 316 SS Support Rods	N

Notes for Normal Operation:

1. Main Drain Valve Ⓛ is closed.
2. Overflow Valve Ⓙ is open. *Can be closed for process sampling and readings.* (Close Inlet Valve as needed)
3. Throttle (open) Inlet Valve Ⓚ for flow.
4. Vent Valve Ⓐ is normally closed.

Gage Rating: 150 PSIG

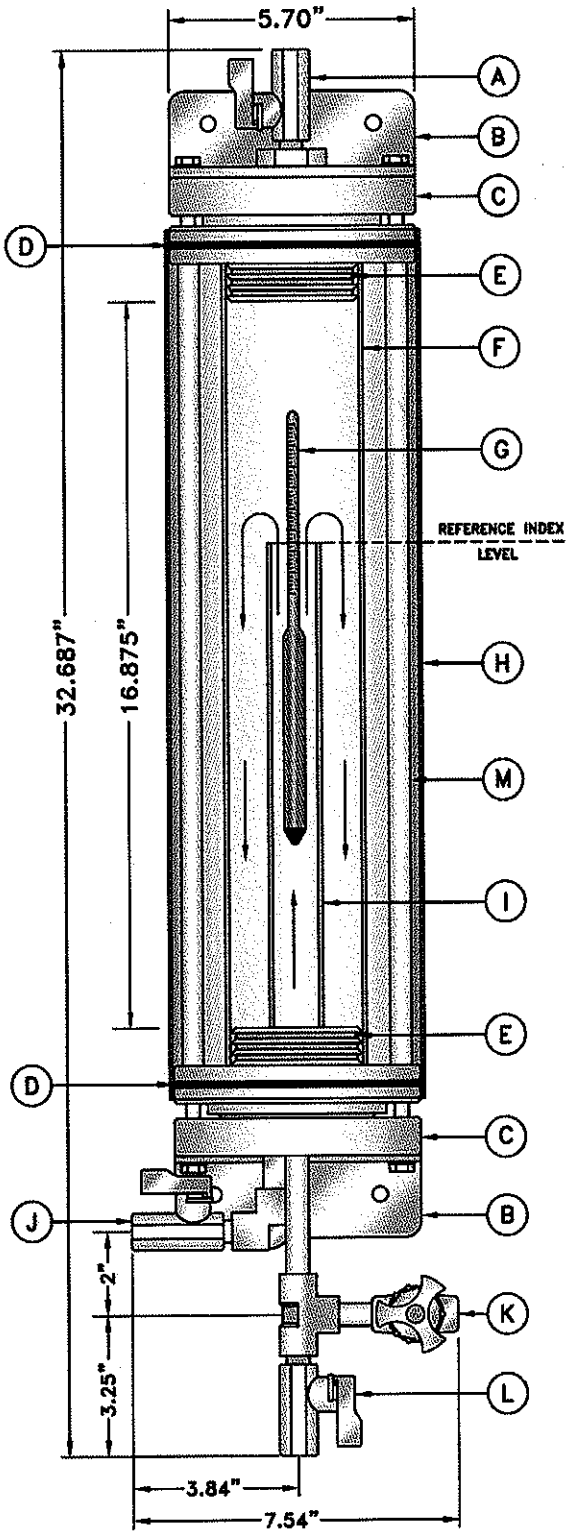


FIGURE 3-1

SPECIFIC GRAVITY ANALYZER

PREPARED FOR

EXXON MOBIL CORPORATION
PASADENA, TEXAS

TERRA DYNAMICS INC

Drawing No.: Figure 3-1.cdr
Date: 03-23-09
Job No.: 09-104
Drawn By: tdm
Designed By: Jogler Inc.
Checked By: tdi

SCALE 1:24,000

1 0 1 MILE

1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Drawing No.: Figure 2-1.cdr
Date: 05-13-09
Job No.: 09-104

Drawn By: usgs
Designed By: TDM
Checked By: TDM

LEGEND

- Dry & Abandoned
- Gas Well
- Injection Well
- 1 Domestic Water Well
- 6 Industrial Water Well
- 1 Unused Water Well

FIGURE 2-1

TOPOGRAPHIC MAP

PREPARED FOR

EXXON MOBIL CORPORATION
PASADENA, TEXAS

TERRA DYNAMICS INC